

# Portland Harbor Brain Benders

**Take the Willamette River Challenge! Test your knowledge of the Harbor and learn new things along the way!**





The Willamette River is one of Oregon's greatest natural resources. Portland Harbor is the portion of the Lower Willamette River that flows approximately from Sauvie Island to the Broadway Bridge. We do fun activities like swim, dragon boat race, float, fish, walk and bike in and along the Harbor. It is an important cultural and ceremonial site for tribal communities. Salmon also migrate through the Harbor on their way to the Columbia River and the ocean.

For over 100 years, Portland Harbor has also been home to many industrial activities such as ship building, lumber production and chemical manufacturing. Unfortunately, some of these activities have caused river sediments to be contaminated with chemicals that are harmful to people and animals.

In 2000, Portland Harbor became a **Superfund site**. The United States Environmental Protection Agency (EPA), the Oregon Department of Environmental Quality (ODEQ) and others are working hard to clean up the contamination for a healthier river. Join the growing group of community members who are learning about the Harbor!

Challenge yourself! We dare you to take this brain bending river challenge to test your knowledge about Portland Harbor. Time yourself on each activity and work together with friends as you learn new things along the way!

1. Portland Harbor became a \_\_\_\_\_ site in 2000.
2. Contamination is the result of over a century of industrial use along the Lower \_\_\_\_\_ River.
3. The primary way people are exposed to contamination from Portland Harbor is by eating \_\_\_\_\_ fish.
4. The three types of resident fish are \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.
5. \_\_\_\_\_ are the main contaminant linked with most of the health concerns from eating resident fish.
6. EPA and the Oregon Department of \_\_\_\_\_ Quality are working to clean up contamination and prevent recontamination of the river in the future.

Need a hint? Search this book for the answers to these questions and more!



# Fishing for Words

Complete the statements to the left, then circle those words in the search below. *Hint: words can be diagonal and backwards.* Have fun!

Y	O	G	X	D	E	K	T	L	R	U	Y	E	V	L
V	D	M	H	A	N	L	Y	B	S	V	V	H	S	O
D	O	L	J	C	V	Q	M	O	N	N	P	S	W	D
N	S	X	T	C	I	W	Z	E	C	K	A	I	C	X
C	D	N	U	F	R	E	P	U	S	B	L	H	Z	Y
X	Y	V	G	B	O	R	H	I	T	L	P	B	K	G
P	C	B	S	H	N	S	P	S	A	F	U	P	K	I
X	I	F	W	V	M	N	C	M	I	V	G	R	M	S
Z	H	A	G	D	E	X	E	J	X	F	G	A	H	Y
H	D	P	I	G	N	T	X	T	X	U	T	C	Z	Q
A	K	M	M	D	T	Q	J	K	T	S	L	A	M	V
S	C	U	G	E	A	S	Q	T	S	J	R	W	C	W
Q	W	O	N	W	L	U	G	I	Z	F	Y	N	Z	Q
P	B	W	T	I	Z	K	Q	F	V	Q	W	Y	Q	G
X	J	A	K	X	J	I	R	E	S	I	D	E	N	T

# To Eat or Not to Eat?

Draw a line to match each fish to its name. Then, circle the migratory fish and cross out resident fish that may have high levels of PCBs.



LAMPREY



CARP



SALMON



CATFISH



STEELHEAD



BASS

Fish such as salmon and steelhead migrate through Portland Harbor, but **resident fish**, such as bass, catfish and carp, may spend their entire life cycle in Portland Harbor. Eating resident fish from Portland Harbor is risky business for people. Resident fish can have high amounts of harmful contaminants.

**Polychlorinated biphenyls (PCBs)** are one of the main harmful chemicals found in Portland Harbor resident fish. PCBs are harmful to people because they can cause cancer or developmental problems. **Children, and women who are pregnant or nursing babies, should avoid eating Portland Harbor resident fish.**

For fish advisory information, visit:  
[www.healthoregon.org/fishadv](http://www.healthoregon.org/fishadv) or  
call (877) 290-6767.

The **Willamette Riverkeeper**,  
EPA, the **Oregon Health  
Authority** and community  
members joined forces to make fish  
advisory signs like the one on the  
right.

The signs offer **anglers**  
information to help make informed  
choices on which fish to eat from  
Portland Harbor, and which fish are  
best released.

See if you can spot signs along the  
river at Swan Island Lagoon boat  
ramp, Cathedral Park boat launch  
and dock, and along the Willamette  
River Eastbank Esplanade in  
downtown Portland.

fish      рыба      cá  
pescado      魚      ntses

# FISH ADVISORY

Atención    Chú ý    注意    Вниманиe    注意

Fish from these waters may be harmful to eat, especially for children, pregnant or nursing women, and women of childbearing age.

	 BASS	 CATFISH	 CARP
	 SALMON	 STEELHEAD	

AREA OF CONCERN  
SIMPLIFIED MAP

More information call 1-877-290-6767  
[www.healthoregon.org/fishadv](http://www.healthoregon.org/fishadv)

**Oregon Health Authority**

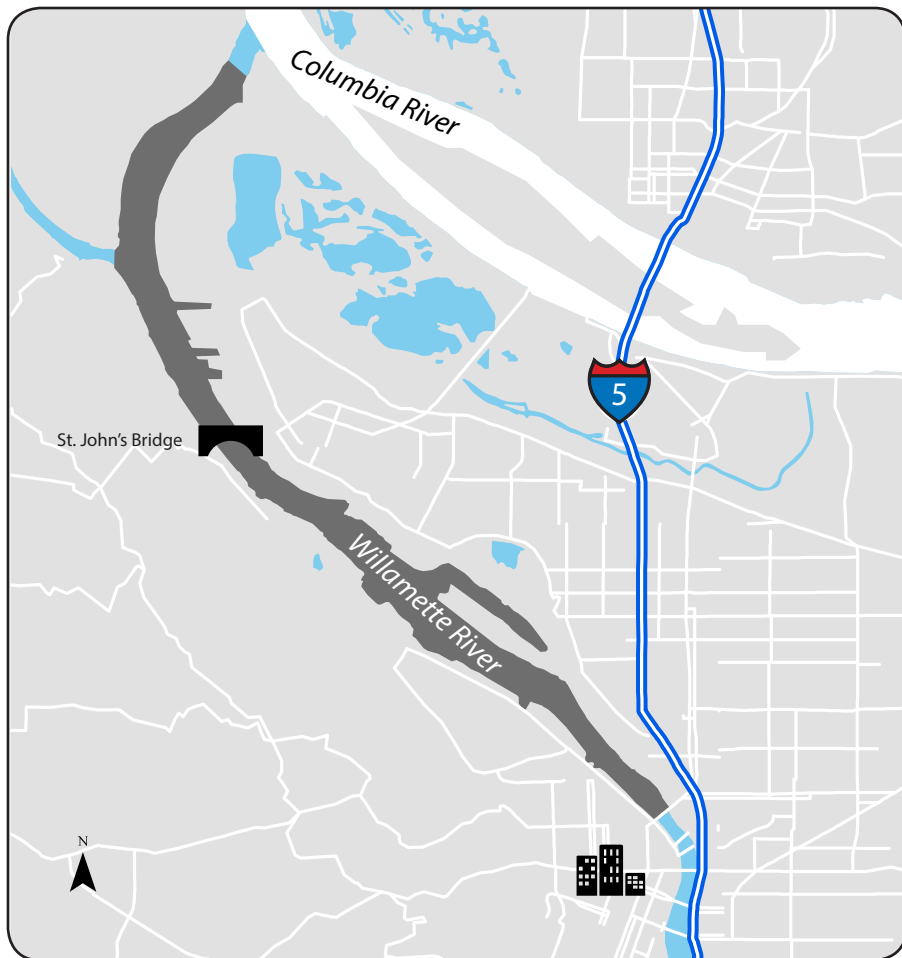
# Map Your River!

*Let's go on a tour of Portland Harbor! For this activity you will need colored pencils and your sense of direction. Follow these steps as you map out your river on the next page.*

1. If you were a bird flying over the Portland Harbor Superfund site, the map on the right is what you would see. The map is oriented to the north (N). Locate the arrow in the lower left corner of the map and circle it. Bonus: write the letters S, W and E for the other three cardinal directions.
2. The Portland Harbor Superfund study area is located on the Willamette River. It is the largest dark grey area on the map; color this area orange and label it. The Columbia River is the largest white area on the map, and it has an island in the middle. Color the river area blue.
3. The map legend describes symbols on the map. Color in the Portland Harbor Superfund study area "square" in the legend to match the color on your map.
4. Downtown Portland is represented with a symbol of buildings on the map. Add the name of this symbol to your map legend. The Moda Center is located across the river to the east of Downtown Portland. Create a symbol on the map for the Moda Center and add it to your legend.
5. Sauvie Island provides important habitat for swans, herons, sandhill cranes, bald eagles and 250 other species. The very tip of this island is located in the upper left-hand corner of the map. Label it.
6. Think about your favorite activities in and along Portland Harbor such as biking, boating, walking, fishing, and swimming. Use your favorite color to shade the areas you enjoy visiting and add a symbol to the legend.

## BONUS!

7. Eight bridges cross over this section of the river. Use a map or search the Internet to find the locations of these bridges and label them on your map. We've already labeled the St. John's Bridge for you.
8. Using the map located at [willamettewatertrail.org](http://willamettewatertrail.org), label the 24-hour public dock near Downtown Portland. Then, label the Swan Island and Cathedral Park boat ramps. Colorful fish advisory signs are posted at the boat ramps you just labeled. Be sure to look for them next time you are there.
9. Using a string, measure the length of the site. Compare the string length to the scale bar in the legend. The Portland Harbor Superfund site is about \_\_\_\_\_ **river miles** long.



## Legend



Portland Harbor  
Superfund Study Area



Moda Center



Bridge



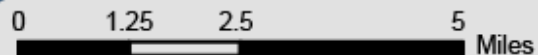
Public Dock



Boat Ramp



Highway





# What in the World?

These photos show close-up views of things related to Portland Harbor. Unscramble the letters to identify what's in each picture. Bonus: use the black letters to solve the puzzle below.



WADORYAB IGEDBR



MEDIESTN



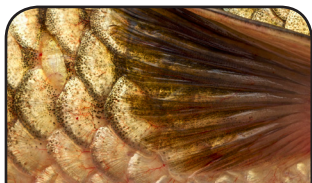
XOCIT HICSLAEMC



DRIBS



TOABGIN



HFSI

*HINT:* The buildup of substances such as PCBs or other chemicals in an organism over time.

## PCBs AND FISH

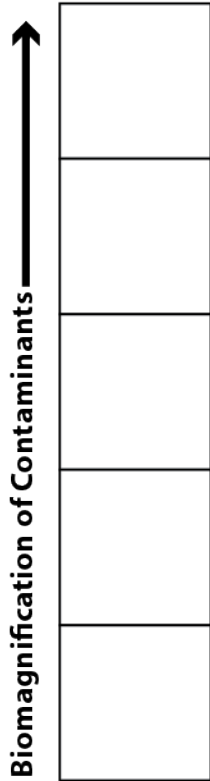
PCBs do not easily break down in the environment. People who eat contaminated fish may be exposed to PCBs that have **bioaccumulated**, or built up, in the fish they are eating.

PCBs enter the environment when they are released into the ground and water. These contaminants can settle in river **sediment** and are absorbed by plants or eaten by small creatures as they dig for food. Contaminated plants and creatures are then eaten by small fish. These small fish are eaten by larger fish. At the top of the food chain, people and large animals may eat the large contaminated fish.

Many contaminants such as PCBs can be found in much higher amounts in fish compared with amounts in sediment and water. This process is called **biomagnification**.

— — — — C — U — U — — — — O —





## Fishy Math

Show how PCB levels build up as we go up the food chain. Start at the bottom box of **phytoplankton**. Draw two small circles to represent PCBs. Go up to the next box of zooplankton and draw twice as many PCBs as you did in the first box. Continue this pattern again in the third box of small fish and double the number of PCBs that you drew in the second box. Continue this pattern until you get to the top box. How many PCBs will you have in the top box?

Answer: \_\_\_\_\_

## GETTING SLIMED!



1. Let's say each piece of plant material has one microscopic slime monster. One insect eats 25 pieces of plant material. This would mean that each insect would have \_\_\_\_\_ slime monsters in its body.
2. If one small fish eats 10 insects, then one fish would have \_\_\_\_\_ slime monsters in its body.
3. One big fish eats five small fish. So, one big fish would contain a total of \_\_\_\_\_ slime monsters.
4. What about you and me? Let's say we eat one big fish a day for three days. We would collect a total of \_\_\_\_\_ slime monsters in our body over the three days. This is how biomagnification works!



## GLOSSARY

**anglers** – people who fish

**bioaccumulation** – the buildup of substances such as PCBs or other chemicals in an organism over time

**biomagnification** – a higher concentration of chemicals in an organism as a result of eating other plants or animals

**Oregon Health Authority** – state office that makes sure people and communities are healthy and doing well

**phytoplankton** – microscopic plants that float in the water because they can't move by themselves or because they aren't strong enough to swim against a current

**Polychlorinated biphenyls (PCBs)** – harmful man-made chemicals that were used in paints, plastics and to insulate electrical equipment, but banned in 1970's

**resident fish** – fish that stay in one place, such as in Portland Harbor

**river mile** – a measure of distance in miles along a river

**sediment** – sand and dirt that settles on the bottom of a river

**Superfund site** – contaminated area requiring cleanup as designated by EPA

**Willamette Riverkeeper** – community group that protects and restores the Willamette River

## Get Involved!

The Portland Harbor Community Advisory Group (CAG) is made up of concerned community members of all ages.

The group's goal is to ensure a Portland Harbor cleanup that restores, enriches and protects the environment for fish, wildlife, human health and recreation.

Everyone is welcome to attend meetings!

Visit [www.portlandharborcag.info](http://www.portlandharborcag.info) for more information on CAG meeting dates and times.

# Contact EPA

Contact the EPA Portland Harbor Team to learn more, schedule a presentation, or share ideas.

Alanna Conley  
Community Involvement Coordinator  
[conley.alanna@epa.gov](mailto:conley.alanna@epa.gov)  
(503) 326-6831

Kristine Koch  
Project Manager  
[koch.kristine@epa.gov](mailto:koch.kristine@epa.gov)  
(206) 553-6705

<http://go.usa.gov/3Wf2B>

Sign up to get emails about CAG meetings, workshops and updates at <http://bit.ly/ptlndhrbr>.

Learn more about land cleanups to prevent the river from being contaminated again. Visit the ODEQ webpage at [www.deq.state.or.us/portlandharbor](http://www.deq.state.or.us/portlandharbor).

## Answer Key

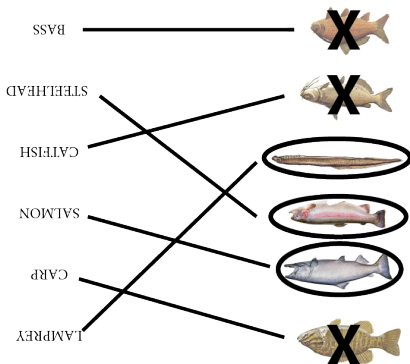
(1) 25 (2) 250 (3) 1,250 (4) 3,750

top answer: 32 PCBs

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(9) The Portland Harbor Superfund site is about 11 river miles long.

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X	O	G	X	D	E	K	T	L	R	U	X	E	V	L
V	D	M	H	A	N	L	X	B	S	V	H	S	O	
D	O	L	U	C	O	M	O	N	P	S	W	D		
N	S	X	T	C	I	W	Z	E	C	K	A	I	C	X
C	D	N	U	E	R	E	P	U	S	B	L	H	Z	Y
X	Y	V	G	B	O	R	H	I	T	L	P	B	K	G
P	C	B	S	H	N	S	P	S	A	F	U	P	K	I
X	I	F	W	V	M	N	C	M	I	V	G	R	M	S
Z	H	A	G	D	E	X	E	J	X	F	G	A	H	Y
H	D	P	I	G	N	T	X	U	T	C	Z	Q		
A	K	M	M	D	T	Q	J	K	T	S	L	A	M	V
S	C	U	G	E	A	S	Q	T	S	J	R	W	C	W
Q	M	O	N	W	L	U	G	I	Z	F	Y	N	Z	Q
P	B	W	N	T	I	Z	K	O	F	V	Q	W	X	Q
X	J	A	K	X	J	I	R	E	S	I	D	E	N	T

PAGE 3

1. Superfund
2. Willamette
3. resident
4. bass, catfish, carp
5. PCBs
6. Environmental

PAGE 2

top row: Broadway Bridge, sediment, toxic chemicals

bottom row: birds, boating, fish

bonus: bioaccumulation



# RIVER FUN!

The Dragon Boat Races and Big Float are two of many fun activities on the river.

We are working for a cleaner river, fish that are safer to eat and beaches that the community can safely enjoy.

What is your vision for the river?



EPA's Technical Assistance Services for Communities Program funded this activity book. This booklet should be printed on recycled materials whenever possible.

